SADC CROP WILD RELATIVES

Final Dissemination Meeting

Meeting report

23 – 25 November 2016, Pretoria, South Africa

'*In situ* conservation and use of crop wild relatives in three ACP countries of the SADC region' (short name - SADC Crop Wild Relatives) is a three-year project (2014-2016) co-funded by the European Union and implemented through the ACP-EU Co-operation Programme in Science and Technology (S&T II) by the African, Caribbean and Pacific (ACP) Group of States. Grant agreement no. FED/2013/330-210.

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Introduction

The 3-year project FED/2013/330-210 "*in situ* conservation and use of crop wild relatives in three ACP countries" co-funded by EU and ACP through Science and technology cooperation programme started in 2014 and will end in December 2016. The project aimed: (i) to enhance the scientific capacities within the Southern African Development Community (SADC) region including the partner countries (Mauritius, South Africa and Zambia) and to conserve crop wild relatives (CWR) and identify useful potential traits for climate change adaptation and (ii) to develop National Strategic Action Plans (NSAP) for the *in situ* conservation of CWR in Mauritius, South Africa and Zambia, as a means of underpinning regional food security and mitigating the adverse effects of climate change.

There is a knowledge gap between the CWR diversity conservation and user communities and a skill shortage in translating conserved diversity into novel varieties. The project has helped to bridge this gap. It has successfully achieved the above objectives and has trained over 50 people from 14 countries in the SADC region on *in situ* conservation methodologies and predictive characterization and pre-breeding. The project has assessed the diversity of CWR, determined where they are located, identified areas rich in CWR diversity and developed NSAPs in three SADC countries namely Mauritius, South Africa and Zambia. In addition the project has carried out a regional CWR diversity analysis and worked with farmers, the ultimate beneficiaries of the project, to study their interaction with CWR and discussed incentive mechanisms for on farm and *in situ* conservation of CWR.

The project dissemination activities are supported by a website, fact sheets, infographics, newsletters, press releases, and participation in international conferences, seminars and training courses. As part of these dissemination efforts, Bioversity International, University of Birmingham and South Africa Department of Agriculture Forestry and Fisheries (DAFF), have organized a final dissemination meeting in Pretoria South Africa to:

- share project results with the partners countries, scientific and policy maker communities;
- share and discuss the experiences and lessons learnt in implementing the project; and
- discuss a scaling out of the project.

The meeting has taken place in Pretoria, South Africa, from 23 – 25 November 2016, in the Southern Sun hotel and included a field visit on the third meeting day. The list of participants is provided in annex 1 and the meeting program is included in annex 2.

Protocol – Welcome and introduction

Noluthando Netnou-Nkoana, (Programme Director for Genetic Resources DAFF) opened the welcome and introduction session. She invited all participants to introduce themselves briefly before proceeding with the welcome addresses.

The first welcome address was delivered by Dr Julian Jaftha (Chief Director: Plant Production and Health, DAFF). Dr Jaftha conveyed greetings from the Director General of DAFF, who was not able to render remarks due to many parliamentary processes which are ongoing and required his attention. He underlined that it has been an honor for DAFF to be part of the project, and mentioned the major events that took place in Pretoria, such as the second training workshop in April 2015, and two stakeholder workshops with valid contributions from national stakeholders. The project led to the first ever NSAP on conservation and utilization of CWR, which was presented at the second stakeholder workshop. South Africa is experiencing the impacts of climate change on food supply and security and has suffered severe droughts. Addressing CWR conservation and use as a potential resource to mitigate these threats is therefore very timely. He reminded that 258 CWR were prioritized for conservation in South Africa, based on their economic value of the related crop and their threat status. They are not well represented in *ex situ* collections. He stressed that DAFF should do everything in its capacity and power to ensure that the outcomes of this project are taken up and further developed and implemented. It is a very unique opportunity to have participated in this project and the challenge is now on South Africa to take it forward. He thanked everyone that has contributed to the NSAP, the international participants who have traveled a long way to participate in this meeting and the local participants who have made time in their schedule to participate, and concluded by thanking the international organizations and the national partners for the guidance they have provided in the project.

Prof Sebola, (Chief Director: Biosystematics and Collections, South African National Biodiversity Institute SANBI) welcomed the participants on behalf of SANBI, major national partner in the project. He acknowledged SANBI's participation in the project, and expressed his recognition to the new collaborations between DAFF, SANBI and the Agricultural Research Council (ARC) in the context of this project. He expressed his thanks to Bioversity for the support in this project, as well as to FAO and the provincial departments, University of Birmingham, and national research institutes. SANBI will be a central partner in implementing and achieving the goals set in the NSAP. The work on CWR will complement SANBI's program of wild plant conservation and allow for comprehensive plant conservation actions in South Africa. He stressed that SANBI is looking forward to effective partnerships and cross-cutting projects to implement CWR work and pledged SANBI's support in further work on CWR.

ARC, Dr Nthabiseng Motete (Group Executive Crop Science, ARC) conveyed greetings on behalf of the president and CEO of ARC, who is away on an overseas trip. ARC is a key partner in food security work and research as well as policy related actions within South Africa and these engagements have positioned ARC well within the CWR research realm. The recent hosting of GCARD 3 in South Africa further shows South Africa's involvement in global programs concerning food security. ARC wants to see itself contributing to the global solutions regarding food supply and security, of which CWR are part of the solution. ARC is looking forward to the outcomes of this meeting and the SC meeting to understand what ARC's role can be to take the CWR work and implementation of the NSAP forward. She underlined that ARC has a good track record on good governance and will bring a lot of expertise to this work.

Dr Ehsan Dulloo, Component Leader, Bioversity International, who has been coordinating the SADC CWR, provided a short introduction to Bioversity International's objectives and an overview about the main achievements of the project. Bioversity is a research for development organization and is part of the CGIAR consortium. It focuses on the conservation and use of agricultural biodiversity (ABD). Bioversity's vision is that ABD nourishes people and sustains the planet. He introduced the project partners, the University of Birmingham (UoB), the University of Mauritius (UoM), DAFF, and the Zambia Agriculture Research Institute (ZARI) and acknowledged the support received by the SADC Plant Genetic Resources Center SPGRC. He recalled the goal of the project in enhancing the link between conservation and use of CWR in three ACP countries within the SADC region as a means of underpinning regional food security and mitigating the predicted adverse impact of climate change.

The specific objectives of the project were twofold:

- Enhance scientific capacities in the SADC region to conserve CWR *in situ* (on site where the species originate) and identify potential traits to adapt crops to climate change.
- Develop National Strategic Action Plans (NSAPs) for the conservation and sustainable use of CWR in partner countries (as a means raise awareness of Government to take account measures for conservation of CWR).

Among the main highlights and results reported are the following:

- The project has facilitated the collaboration between the environmental and agricultural sector in all countries, which are seldom found working together.
- Many scientists in the room would know about importance of CWR but this were not the case at policy maker level. The NSAP development has served to increase that awareness and support action by policy makers to address food security through work on CWR.
- The project has provided training to scientists and breeders on how to conserve CWR *in situ* and how to harness the potential within these resources for crop improvement to meet the needs of growing food demands. This was achieved through two regional training workshops. Training material was developed as well as an interactive online toolkit for conservation planning. He noted that the toolkit has already been taken up by the IUCN Species Conservation Planning Subcommittee.
- Distribution of diversity and diversity hotspots were assessed, CWR were prioritized for conservation and priority sites for *in situ* conservation determined, both at national and regional levels.
- All diversity and conservation analyses carried out on CWR have served as firm scientific basis for the development of national NSAPs.

- The regional analysis can be used to develop a regional strategy for CWR in the SADC region. UoB has been working closely with SPGRC to develop a draft concept note on an integrated strategy for conservation of use of CWR for the SADC region.
- The project has worked hard to involve all stakeholders, right from the beginning, as stakeholder buy-in is critical for the development and implementation of the NSAPs.
- The project team raised awareness about the project and the importance of CWR globally at international meetings. For example, the first International Agrobiodiversity Congress IAC2016, held in November 2016 in New Delhi, India, has seen a whole session on CWR, where the partners of this project provided several presentations. The project was also presented at the multi-stakeholder dialogue about a global network for *in situ* and on-farm conservation that took place in the occasion of the FAO Commission on Genetic Resources Technical Working Group meeting on PGRFA – 6-7 June 2016.

He concluded by saying that he would like to see a scaling out to the other SADC region, and to other countries in the world. He also mentioned that Bioversity would be launching the summary of a book on the mainstreaming ABD in sustainable food system at the 13th meeting of the Conference of the Parties to the CBD, COP13, which will take place in Cancun Mexico, as a scientific foundation for developing an ABD index, in which specific reference is made to *in situ* conservation of CWR.

Session 2: Showcasing the results of the project

Session two featured presentations about CWR conservation planning from all three partner countries followed by a discussion section.

CWR conservation planning in the Republic of Mauritius

Navindra Boodia, UoM, reported about CWR conservation planning in Mauritius. He described the process and resources used for the checklist development and the prioritization of CWR. Ten CWR were prioritized for the island of Mauritius and 8 CWR for the island of Rodrigues. He described the current status of *in situ* conservation of CWR in the Republic of Mauritius and the use potential in breeding of the three wild coffee relatives prioritized for conservation. He concluded with listing the following strategic actions identified to implement CWR conservation in Mauritius:

- Protect and restore the ecosystems of CWR *in situ* to maintain the existing populations and encourage natural regeneration, with particular emphasis in controlling invasive and alien species and expanding protected area (PA) network to include CWR hotspots.
- Develop an efficient *ex situ* conservation program for CWR to conserve priority CWR in gene banks.
- Develop innovative mechanisms for the efficient use of CWR through carrying out research in predictive characterization and pre-breeding activities as well as involving NGOs and local communities.
- Establish an efficient system for the dissemination of scientific knowledge with the various stakeholders and awareness of CWR amongst the local population and other users,

CWR conservation planning in South Africa

Domitilla Raimondo, SANBI, reported on the identification of priorities for CWR conservation in South Africa, which was led by SANBI, in collaboration with ARC and DAFF. CWR have been included as a target in South Africa's Plant Conservation Strategy, a CBD linked commitment. She described the process followed to develop the checklist and to prioritize CWR for conservation planning in South Africa, through which 258 taxa were listed as highest priority for conservation, of which 93 are endemic to South Africa. South Africa used a systematic conservation planning methodology to identify the best sites to conserve priority CWR. She reported that as forthcoming steps to start implementing *in situ* conservation is planned to engage with conservation authorities via the Department of Environment's Working Group 1 in January 2017 and with the Stewardship National Forum (group responsible for expansion of Protected Areas) in April 2017 to ensure that sites important for CWR, are prioritized for conservation. She pointed out that megadiverse countries like South Africa have many conflicting

conservation priorities which require that CWR priorities are aligned to existing priorities in order to not present additional burdens. For this reason the selection of *in situ* sites outside protected areas focused only on endemic species. Regarding *ex situ* conservation of priority CWR she reported that those are very poorly represented in the National Genebank at DAFF and sufficient samples need to be collected to ensure that the genetic diversity of all 258 priority CWR taxa is conserved.

CWR conservation planning in Zambia

Dickson Ng'uni, ZARI, reported on CWR conservation planning activities in Zambia. He underlined the importance of involving national stakeholders such as policy makers, media, researchers, breeders, environment and advocacy in the process. Stakeholders were involved in the prioritization of cultivated crop species, the validation of the generated CWR checklist and the review of the draft NSAPs presentation. He then described the process of checklist development and prioritization of 30 CWR for conservation in Zambia, as well as the data collection and analyses of diversity and conservation gaps. He reported that the following key strategic actions had been included in the NSAP, which has been submitted for endorsement to the Permanent Secretary of their Ministry of Agriculture:

- Lobby for funding of CWR conservation activities through NBSAP's Biodiversity Financing Initiative.
- Inclusion of policy statements on CWRs in the various policy documents and development plans.
- Integration of CWRs in management plans and conservation programmes.
- Creation of functional and effective partnerships for systematic and coordinated conservation and sustainable use of CWR.
- Develop national capacity for CWR characterization and breeding in the national agriculture research system.

He concluded by listing the concrete actions contained in the Zambian NSAP for *in situ* and *ex situ* conservation, utilization of CWR, capacity building and public awareness.

Discussion Q & A

The discussion following the three presentations about conservation planning in the three partner countries focused on the following points:

- It was questioned why Mauritius chose so few priority CWR out of over 140. The Mauritian representatives explained that the scoring method used was similar to that used in Zambia and South Africa. The number of selected species depended on the score value considered as level above which species were considered a priority. UoB added that there is no rule, the selection might depend on the capacity to conserve, both from a financial as well as from a human resource point of view. High, medium and low priorities could be identified and a country could start with the high ones.
- The feasibility of the expansion of protected areas to include CWR was discussed. It was argued that land is very precious and therefore this measure could be too expensive to be carried out. *Ex situ* conservation would be a much cheaper way, but both conservation methods have different advantages and need to be seen as complementary, not competing. In all three countries there is expansion of protected areas ongoing and this expansion could become a factor influencing the selection of sites, as has been considered in South Africa. The current iteration of PA expansion in South Africa has been decided very recently, so the project could not influence the selection of sites for the expansion planned for the coming five years, but can aim to do that in the next iteration in five years' time. The expansion is carried out at provincial level. SANBI met with the provinces and have given them the CWR *in situ* conservation priorities. In Zambia the agency responsible for PAs has been involved in the project, so they will likely take CWR into consideration in future. The national biodiversity assessment has been carried out and the first NBSAP was reviewed. Within the review it was recognized that the PA system will need to be reviewed and this review can take CWR into consideration. Similarly in Mauritius a PA Network Expansion Strategy has been developed and consideration of includes the priority CWR sites has been taken on board. There are also incentives to landowners to participate in PA expansion network. However it can be a long, expensive and intensive process.

Session 3: Showcasing the results of the project cont.d

Session three continued with reporting further results of the project, focusing on predictive characterization results in South Africa, the application of genomics for the classification of CWR and the development of a concept for an integrated CWR conservation strategy in the SADC region.

Predictive characterization in South Africa

Willem Jansen van Rensburg, ARC, reported on the selection, through predictive characterization, of populations of wild sorghum and cowpea potentially harbouring drought and heat tolerance traits. He noted that some wild *Vigna* species would probably require taxonomic revision and that the wild sorghum species with the most occurrences was *Sorghum halepense*, considered an invasive species in South Africa. He reported that during a potato breeding programme they realized that drought tolerant accessions would not survive under heat. This experience recommended to consider heat and drought tolerance together. He described the data sets used and the process applied to identify 46 *Sorghum* CWR populations and 29 *Vigna* CWR populations that could be further characterized for drought and heat tolerance. Further analysis identified 10 wild *Sorghum* populations and 2 wild *Vigna* populations as most probable to have these traits. It is planned to collect the identified *Vigna* populations for characterization. Selected *Sorghum* CWR populations are likely to be taken up in an ongoing sorghum breeding program.

Biodiversity genomics: applications for classification of CWR in Mauritius

Yasmina Jaufeerally Fakim, UoM, focused on genetic diversity assessments. She briefly outlined the current main two concepts that are used to classify CWR, the taxon group and the genepool concept. With the current advances in genomics it will be easier to include data on genetic diversity in conservation planning. She notes that chloroplast, mitochondrial and nuclear DNA sequences have been incorporated into taxonomic keys, where chloroplast and mitochondrial DNA have smaller genomes and much more conservative sequences than nuclear DNA. Also DNA barcoding would have greatly improved species delineation. Many plant genomes have now been sequenced and the majority of food and fiber crops have at least one genome assembly in the public domain. The project team in Mauritius is currently working on assessing the genetic diversity in two varieties of the palm *Dictyosperma album* with transposable elements (TEs). DNA extraction did not work with the usual extraction kit as these plants are very fibrous. An alternative method was identified and they managed to extract DNA from young plants. She reported that the work is not yet completed and it would be too early to make conclusions as more samples need to be tested. They plan to analyze the relatedness of the two palm varieties to assist in conservation management.

Concept for an integrated CWR conservation strategy in the SADC region and selection of priority species

Shelagh Kell, UoB, presented the concept for an integrated strategy for CWR conservation in the SADC region which was mainly derived from the European concept, which had been developed under the leadership of UoB on behalf of the European Cooperative Program for Plant Genetic Resources (ECPGR). She described the process of identifying the CWR of the SADC region and the prioritization process adopted that identified 113 priority taxa. The concept of an integrated strategy considers two core levels of conservation planning – the national and regional approaches. She described how they can be linked and integrated and concluded with a list of five key messages:

1. The SADC region contains a wealth of CWR diversity with potential for crop improvement, particularly to mitigate the impacts of climate change on food production.
2. The region's CWR diversity is an important resource for the maintenance of food security and for safeguarding the substantial economic gains to the region through crop production.
3. Advances in our understanding of CWR diversity in the region, as well as in planning for their complementary conservation, provides a solid foundation for the development of a strategic approach to their conservation in the region based on a range of commonly agreed and widely tested scientific concepts and techniques.

4. Achieving effective conservation and utilization of CWR diversity in the SADC region will require a coherent, regionally coordinated policy and the appropriate resources to fund their conservation, characterization and evaluation.
5. To achieve sustainable conservation of CWR in the SADC region and to maximize their sustainable use, there is an imperative to develop a regionally-led policy to harmonize their conservation, characterization and evaluation with existing biodiversity conservation and agricultural initiatives, and to develop new initiatives where necessary.

Discussion Q & A

The discussion following the presentations touched on the following points:

- Regarding the work on known *Dictyosperma album* varieties from Mauritius, it is still not known whether they are able to intercross and further studies on this would be desirable.
- The usefulness of genetic analysis for conservation planning and monitoring of diversity was discussed. It was pointed out that genomic analyses methodologies are fast evolving and caution would need to be exercised in comparing genetic diversity results as the methods may not detect the same kind of diversity.

Session 4: Showcasing the results of the project cont.d

The last session of the first meeting day focused on the economic aspects of CWR conservation investigated in Zambia, conservation planning at regional level and the description of the tools for conservation planning developed by project staff in Bioversity and UoB.

Incentive mechanism for CWR in Zambia

Graybill Munkombwe, ZARI, presented the work on incentives for *in situ* conservation of CWR in Zambia, which was carried out under the lead of Bioversity's economist Adam Drucker. Competitive tenders for CWR conservation contracts with farmer communities in Zambia were undertaken to determine the costs associated with *in situ* conservation at sites adjacent to Game Management Areas and sites far from Game Management Areas. He explained the methodology used and the key findings achieved, and concluded with the following recommendations that were derived from the study:

- Efforts should focus on Area Management Option (AMO)-Borders and AMO-Common given significantly higher species, abundance and genus counts were recorded in these areas thereby increasing the cost effectiveness of conservation services per hectare.
- Identification of areas with relatively high concentrations of CWR (abundance and diversity) is a priority for targeting locations where incentives for conservation should be implemented.
- Implementation of a tender-based CWR conservation programme would require that a monitoring programme (likely to require both conventional and participatory monitoring methods) be implemented in order to assess both; Compliance and The actual impact (relative to an established baseline) on CWR diversity and species under the respective AMOs.

CWR conservation planning in the SADC region

Joana Magos Brehm, UoB, presented the conservation planning carried out at regional level and described the occurrence data compilation, the *ex situ* and *in situ* gap analyses, the modeled impact of climate change on CWR distribution, the identification of *in situ* conservation sites and collecting priorities for *ex situ* collections, as well as the integration of national and regional *in situ* conservation priorities. The key messages concluding the presentation were the following:

- Madagascar, Malawi, Mozambique, South Africa, Swaziland, Tanzania and Zimbabwe include hotspots of priority CWR in the region.
- SADC priority CWR are poorly conserved both *ex situ* and *in situ*.
- More than 50% of priority CWR are likely to lose distribution area with climate change (CC).

- Seychelles, Zimbabwe and Mauritius are likely to become ecologically less suitable for more priority CWR hence more priority CWR are likely to get extinct with CC in these three countries.
- *In situ* conservation network has been planned taking into account both ecogeographic diversity and CC impact (133 PAs + 163 sites outside PAs).
- DRC, South Africa and Tanzania are key countries for *in situ* conservation of CWR diversity predicted not to be negatively impacted by CC in the region.

Conservation planning tools

Joana Magos Brehm also presented and described the tools for supporting conservation planning that were developed during the project. These tools have been developed to guide and support individuals and institutions in CWR conservation planning and in the development of NSAP for the conservation and use of CWR. They support standardization, the reduction of errors in the data and last but not least allow saving time. The tools developed in the project are: the Interactive Toolkit for CWR Conservation Planning, a CWR checklist and inventory tool in MS Excel, an occurrence data collation MS Excel template, a technical background document as well as a NSAP template in MS Word.

Discussion Q & A

The discussion following the presentations included the following points:

- How could the incentive mechanism for CWR *in situ* conservation be financed? Dickson suggested that it should be investigated whether it could be done through a similar process as used in Zambia for rewarding local communities for game conservation. Also income generated by tourists could be used for this.
- In Zambia it was specified that incentives would not go to farmers personally. The incentives would not be paid as cash money, but the farmers would suggest various options how they could be supported at community level. If they were to take care of the CWR, in return the government would implement determined measures to the benefit of the communities.
- Ehsan underlined that this work highlighted in particular how farmers could be involved in local conservation actions. The incentive mechanism approach applied in the project has been successfully undertaken in other countries. For example in Peru, the incentive mechanism work for landraces has been commissioned and supported by the Ministry of Environment as part of their rural development projects.
- These studies would also inform the NSAPs on how the conservation outside PAs could be supported and what the costs would be incurred.

Ehsan Dulloo concluded the day with the following remarks: the presentation of the first meeting day provided an excellent opportunity to listen to major project results that informed all partners what was achieved in the other countries, and that they proceeded in similar ways in very different contexts. Not all countries could carry out all aspects of the work, such as predictive characterization, which was carried out only in South Africa or the economic aspects that was addressed in Zambia, as the other countries could not identify staff members or students to carry those studies out. Mauritius engaged into analysis of genetic diversity, an aspect that was not considered in the general approach taken by the project. Furthermore the planning was applied at regional level which provided an additional wider perspective on CWR diversity in the region. The tools developed and presented should be shared widely to support other organizations and countries to carry out conservation planning for CWR.

Session 5: Policy session

Session 5 focused on national, regional and global perspectives on policies and frameworks addressing plant genetic resources (PGR) and CWR in particular.

National perspective on CWR conservation in Zambia

Godfrey Mwila, ZARI, presented the national perspective on CWR conservation in Zambia. The Ministry of Agriculture and the Ministry of Lands, Natural Resources and Environmental Protection were key in the implementation of the CWR project. In general, the approach followed in the implementation of the SADC Crop Wild Relative project, which involves several stakeholders has led to enhanced linkages and strengthened collaboration and coordination among key players/institutions involved with the conservation and use of CWR, for example the prospects of using PAs are much brighter through the involvement of ZAWA in the implementation of the CWR project. He underlined that the NSAP fits into the broader national plans and programmes related to implementing policies in the agriculture and natural resources and environmental protection sectors such as the National Agriculture Plan and NBSAP. The latter was under review during the implementation phase of the project which allowed to better address CWR conservation in its second version. However, he reported that a lot remains to be done to sensitize policy makers and other stakeholders on the importance of CWRs and the need to support programmes aimed at their conservation and use. He concluded that the general view, especially from ZARI's perspective, the institution coordinating the implementation of the project, is that the project has been successful. There is a need for concrete follow up action to build upon and sustain these successes. One such effort is to do more to demonstrate the economic value of CWRs.

Ehsan Dulloo invited the other two countries to provide a brief statement about the involvement of policy makers respectively in Mauritius and South Africa. Yasmina explained that UOM did engage with policy makers right from the start. The deputy Permanent Secretary was involved and played an active part of the project implementation team. Thabo reported that South Africa engaged from the start with SANBI, who is closely working with the Department of Environmental Affairs, and also engaged the ARC. Through the NSAP development they engaged relevant stakeholders. The science and technology department, as well as the biotechnology department were also involved. The challenge is that conservation issues are spread among different government departments. Therefore they have tried to identify the overlaps and links, and to identify who of the policy makers are responsible and with which role.

SADC policies on conservation and use of PGR

Thandie Lupupa, representing SPGRC, then presented regional SADC policies on conservation and use of PGR, on behalf of the acting Director Mr Barnabas Kapange. She first described the general approach taken at SADC level. The SADC recognizes the important role of good environmental management in the social and economic well-being of the people, particularly during these challenging times of climate change. For this reason natural resources require integrated actions at national, regional and international levels. Most SADC legislations support biodiversity conservation in designated PAs, however they are not necessarily designed specifically to address the conservation and use of neither PGR nor CWR. The PAs in the region focus more on ecosystems and conserve a broader range of plants including wild life. Some PAs do not have inventories of existing plants which complicates conservation for edible plants and CWR. Ms Lupupa then explained several of the regional protocols and policies related to PGR conservation and use, which include: the Protocol on Environment for Sustainable Development (2014); the SADC Protocol on Forestry (2002); the Revised SADC Protocol on Shared Watercourses (2002); the SADC Protocol on Wildlife Conservation and Law Enforcement of 1999 (Wildlife Protocol). Other relevant regional documents are: the Regional Biodiversity Strategy of 2006 (RBS) – not legally binding, complimented by the SADC Regional Biodiversity Action Plan, 2013 (RBAP) that aims to operationalise the RBS. Regarding PGR policies she explained that most, if not all countries, have sectoral policies and regulations, administered by different ministries without proper collaboration, and mentioned that in some cases, these laws are out-dated and need amendment. Often national agricultural policies do not explicitly address plant genetic resources for food and agriculture (PGRFA) conservation and sustainable utilization. SADC Policy Guidelines for PGR exist and priority area 2 of the guidelines on implementation and promotion of *in situ*/on farm and *ex situ* conservation specifically includes CWR. She pointed out that there is need to better publicize the SADC Policy Guidelines for PGRFA and stresses in her concluding remarks, that a regionally coordinated strategy need to be developed and should incorporate activities that will ensure the identification, collection and conservation of important CWR in the region.

Global perspective on CWR conservation and use

Chike Mba, (Senior Officer and Team Leader, AGP, Plant Production and Protection Division, FAO, presented global perspectives on CWR conservation and use. He briefly introduced the Seeds PGRFA Division, which works on *ex situ*, *in situ* and on farm conservation, and on sustainable use through plant breeding and seed delivery systems. Their aim could be summarized in translating the potentials encoded into the genetic blueprints of PGRFA into improved productivities on farmers' fields. He underlined the importance which PGRFA has in improving food security and adapting to climate change. As we are presented with a finite natural resource base, the most viable option is increased productivity. The genetic diversity harboured in PGRFA needs to be harnessed to broaden the narrow base of many crops and to improve biotic and abiotic resistances. He described the developments that eventually led to the Second Report on the State of the World's PGR, highlighting the gaps and needs reported therein, and the Second Global Plan of Action for PGRFA (GPA2). To support conservation and use of PGRFA, FAO has developed guidelines for developing a national strategy for PGRFA and technical guidelines for national level conservation of CWRs. It also developed an online course on pre-breeding for effective use of PGRFA through its Global Initiative on Plant Breeding (GIPB). Lastly he reported about the progress towards the development of a Global Network for *In situ* and On farm. Following a request by the Commission on Genetic Resources for Food and Agriculture (CGRFA), FAO has now convened a multi-stakeholder dialogue to brainstorm on the options for establishing global network(s) for CWR and landrace conservation and FAO will present a revised concept note at the Commission's 16th Session in early 2017.

Discussion Q & A

The three presentations on the national, regional and global perspectives are followed by some discussion. The major points are listed below.

- In reference to her presentation on regional policies and CWR activities within SPGRC, Thandie Lupupa reported about a farmer who is cultivating a wild relative of cowpea behind her housefor medicinal purposes. The only collecting by SPGRC on CWR has so far been on cowpea, and was informed by farmers. It was eye-opening as many farmers have much more knowledge about wild relatives than the scientists did.
- Ehsan Dulloo enquired whether the outcomes of the SADC CWR project could be taken up to guide the development of the global network. Chike Mba agreed that very good work has been done and it is important to market what has been done in the project at the global level so as not to lose this impetus.
- Yasmina Jaufeerally-Fakim enquired how successful the implementation of the global treaties have been. Chike Mba pointed out that there are indicators for monitoring the implementation of GPA2. There are 63 indicators and there is a reporting format to be used by the national focal points. So far however only about 40 countries have reported. The priority area that countries gave the greatest attention was sustainable use. *In situ* did not seem to have featured that highly. Reporting requires that you have to work across ministries so might be a reason for slow or incomplete reporting. We need to come together at the global and regional levels and reduce the burden on reporting at national level. Indicator 2.5.2 of the SDGs relates to *ex situ* conservation. There are also the Aichi targets. This should all be harmonized so that the countries can report to all these indicators.
- Thandie Lupupa noted that there is a positive trend in the SADC region. The initial focus was to rescue traditional crops in *ex situ* collections. Then *in situ* conservation was added. Now they are starting also to look into using what has been collected. Tanzania and Malawi had been the first countries to look at CWR. As all countries were somehow participating in this project, the awareness has started to build up and progress is positive.
- Shelagh Kell (UoB) indicated that in general there is still a big gap between conservation of CWR and their use. There had been several EU funded projects to address this gap, looking at novel approaches, for example in the PGR Secure project. One work package specifically addressed the involvement of the user community. In general actions still seem ad hoc. EUCARPIA meeting had their PGR session at the end although PGR are the basis of breeding. Of course there are issues with

breeding involving CWR and we need to increase the amount of characterized CWR genetic resources. What more can we do as a community to bring it closer to the plant breeders?
- It was pointed out that institutions are already using CWR such as the CG centers, which are very much aware of their value. The major institutions have the resources to carry this out. The International Treaty continues trying to implement public private partnership regarding pre breeding of CWR to leverage resources, which are still a problem.

Session 6: Lessons learnt and scaling out strategies

Ehsan Dulloo chaired the session and asked the national coordinators in turn to provide their reflections on what went well and what could have been done better in the project.

Yasmina Jaufeerally-Fakim from Mauritius made the following points:

- Having members from different institutions in the project was the right approach for Mauritius.
- Regular interactions with higher level officials to keep them abreast of what was achieved would have helped in getting more rapid progress.
- Access to data was a major problem, as it had required to see different people and receive it from different institutions. It was also a very hierarchical process. Everybody had to agree in releasing the data.
- Visibility actions should have started in the first year, rather than waiting until later in the project.
- Training should have been more targeted, not involving people on the committee but those already using the tools and getting them involved.
- Genetic diversity and threat assessment was properly not addressed although mentioned in the proposal.
- Mauritius did not validate georeferenced data compiled, due to the lack of time. It took a lot of time to get the project started and many obstacles in getting occurrence data of priority CWR started very slowly.
- It would have been good to have more interactions across the SADC region, i.e. among the countries, to compare progress and exchange experiences. It had taken too much time to generate the checklist, which has then delayed the whole project. They could have learned from South Africa, which has delegated specific roles to other partners like ARC and SANBI. As the data was mainly owned by different institutions they would have been involved in a different way to proceed more quickly.

Dickson Ng'uni, ZARI, presented lessons learned for Zambia. He noted that the project had received institutional support as it was located within the Ministry of Agriculture.

- There has been knowledge build-up in the application of tools for spatial analyses and enhanced capacity for objective decision making towards conservation of priority CWR taxa.
- One challenge has been limitation of sources of data for priority CWR taxa, leading to huge discard of records and a reduced number of records involved in the final analyses.
- Stakeholder involvement in the conservation planning process of CWR should be seen as critical. Results would not have been achieved without them. They should have been brought on board earlier. Some data is sitting with institutions that generate it and it is difficult to obtain it.
- Limitation of taxonomists adversely affected species identification.
- Need for an innovation platform for sustainable utilization of CWR involving conventional breeders, molecular biologists, taxonomists, conservation biologists, media, to support taking forward project activities.
- Going forward, there is also the need for creation of functional and effective partnerships for systematic and coordinated conservation and sustainable use of CWR.

Ehsan Dulloo added that a major issue in Zambia was the regular communication. Despite connectivity problems participation from Zambia has been exemplary and Dickson has been able to master the

partnerships in Zambia bringing them on board. It seems that there is hope that the governments take some ownership on this work and take it forward based on the NSAP.

South Africa's reflections on the project were provided by Thabo Tjikana, DAFF. He stated that the project was indeed necessary in South Africa. What could have been done differently?

- Communication between countries could have been more frequent.
- DAFF first started off on their own. The involvement of SANBI and ARC should have started much earlier, probably at project development stage. Eventually five institutes were involved in compiling the checklist.
- The NSAP template was very well received and very helpful.
- Communication was critical and has hampered progress.
- A challenge was to agree on food and fodder focus for prioritization, leaving out a lot of other crops. It was difficult to agree on this.
- The project has helped the genebank to identify actions on CWR and realize that the mandate is not only on crops but also on CWR.
- Now it is the challenge on how to continue after the project to achieve the goal.

Ehsan confirmed that South Africa scored high in developing partnerships and agreed that we should have done that at the beginning to identify the relevant partnerships and collaborators. More time should have been dedicated to this at proposal stage. He reiterated that data collection has been a challenge for all the countries.

Nkat Lettie Maluleke (DAFF) pointed out that stakeholders would have preferred that local cultivated crops were included in the work. This was a real challenge as they had to take stakeholders into account. They accommodated this in a way to include a box on this in the NSAP and explain the difference to CWR, but still it is considered that it would have been appropriate to include them. Regarding field work, she added, they have managed to do surveys in three provinces, but the validation was not sufficient. Also due to late rains they could not validate as much as they wanted. Ehsan acknowledged that field work is always expensive which is a limitation and needs to be done in timely manner. He encouraged that the validation be pursued during the implementation phase of the NSAP.

Thandie Lupupa gave a presentation on some aspects and thoughts about a regional strategy for CWR conservation in the SADC region. The key points from the presentation are as follows:

- A regional strategy - if in place - will take care of cross-border resources including those that are a priority to the region.
- The existence of a regional strategy can lead to the development of a harmonized policy.
- Conservation-worthy rich diversity areas can be identified and accorded close monitoring if they are outside PAs.
- Development of CWR conservation strategies should take into account local needs and indigenous knowledge.
- Conservation and collection activities will be well coordinated at regional level.
- A concept for an integrated regional CWR conservation strategy has been developed and will be presented to the SPGRC technical meeting in December 2016.
- There will be need for fund mobilization for scaling up the development of national and regional strategies.

Some discussion points following Thandie Lupupa's presentation were the following:

- Do we have data about which CWR have nutritional and medicinal value? These data would help to raise awareness and assess ecosystems and ecosystem services. It could inform the regional assessment of ecosystems and ecosystem services done by IPBES and contribute to the chapter

that is being drafted by South Africa. Chike Mba noted that there is a need to look at this from a more programmatic perspective. We could relate to universities and invite them to do research studies on nutritional values of these plants, take advantage of opportunities that might arise.

- SPGRC looks at CWR and edible wild species together at the regional level. If we move forward with CWR, we need to include the edible wild species as well, as they are equally important. People in rural areas go into the wild and harvest vegetables and food to cover the hunger gap period.
- Are edible wild plants included in the work carried out in SADC CWR project? Ehsan responded that the project was conceived to focus on CWR, but the project has allowed us to also reflect on this other group, and the approaches used developed in SADC CWR can also be applied similarly to these plants.
- Shelagh Kell (UoB) pointed out that however we need to recognize the difference between CWR as resource for breeding and the wild harvested plants for direct use. These uses are very different, for breeding and for food. And approaches to conserve them might be different.
- Godfrey Mwila (ZARI) said that CWR could benefit from being tight to the edible wild plant species agenda, as people understand the utility and use of edible wild plants more easily. It could help to improve CWR visibility. He would agree to broaden the approach, without forgetting from a technical point of view that they are different.

Session 7: Steering Committee

The Steering Committee (SC) was held during this session. It was a closed session and was attended by members of the SC only. The outcome of the SC was reported back in plenary in the following session.

Session 8: Closing

Reporting back by the chair of the Steering Committee

The chair of the SC reported back to the group on behalf of the committee. The SC advised the project coordination and the committee met three times during the project. The committee was impressed by the coordination and how the project coordinator took on board recommendations from the SC. The SC did a thorough review of the project status, looking at the GANTT chart, the work plan, and project activities. The SC was unanimous on an extremely positive impressions of the project deliverables. The project coordinator has been very dutiful in reporting. He also made the SC tasks easy in providing status on all activities. What the SC saw was basically a validation of the several impressive results presented in the different sessions of the Final Dissemination meeting. Most of the expected outputs have been fully achieved. Some remain ongoing, a few have only be partly achieved due to justified reasons. Regarding the way forward, the SC wanted its chair to communicate that the conclusion of the project is not an end but just a stepping stone for continuing to work on CWR. We have several tools that are available to scale out. It is the opinion of the SC that the role of SPGRC is pivotal in going forward, being an intergovernmental organ, having resources and mechanisms to connect people and raise awareness. It should ensure that results are leveraged to expand this work into the region.

The chair furthermore underlined that there is a need to go ahead and prepare peer reviewed publications to make results known. This will help to underline the real importance of the work we do. It would be shame if the NSAPs became another document to put on the shelf and leave them there. They were based on a multi-stakeholder dialogue and they should be implemented. It would be prudent to make this not only a thing of the Ministry of Agriculture but also involve ministries of environments or natural resources or even tourism. He informed that SPGRC promised to mainstream CWR work in their *in situ* conservation portfolio, e.g. revising the germplasm collecting form. The draft concept of an integrated strategy will be discussed at the forthcoming technical meeting of the SPGRC. Pre-breeders should be targeted to take up CWR. For those who can influence curriculum development should be encouraged to include pre-breeding and CWR in the curricula for future breeders. Some of the practical

issues that SPGRC will address is information sharing. Everybody should think about opportunities to multiply the results of the project. For example Mauritius will reach out to other islands to support them in addressing CWR conservation. Everybody is invited to own the successes and make them grow.

The project coordinator thanked the chair and the SC for their guidance throughout the project and said that it has been a real pleasure to work with all of the partners. It have been three impressive years, not always easy, sometimes very tough. He appreciated that there was a lot of personally engagement. He thanked UoB and noted that although Nigel has not been very 'visible' recently he has been advising throughout the project. He hopes that the partners take ownership and write up results in peer-reviewed publications. Bioversity and UoB will be available to support preparation of the manuscripts. He then invited the participants to express a short personal statement on the project.

Concluding remarks

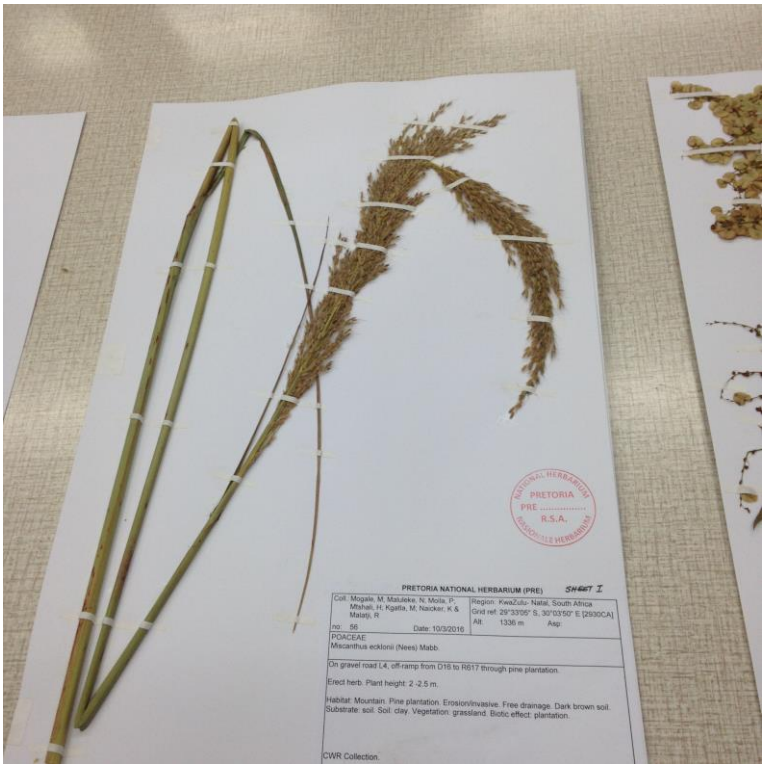
In conclusion of the second day and the meeting, the project coordinator thanked the host DAFF and all their staff who have worked hard in organizing the meeting and the field day.

Mpolokeng (DAFF) expressed her thanks to Ehsan Dulloo. She started new with DAFF this year, and had felt like in grade 1 at the beginning, having to learn a lot on PGR. She expressed her appreciation to her director, Noluthando Netnou-Nkoana, who she considers a great leader. She would make sure to pull it through to make the NSAP a success and has been pivotal in reaching the results. Thabo joined the thanks and wished to thank first of all Angeline Dibiloane for organizing the workshop. He also thanked the EU ACP for the funding to carry out the project. He extended thanks to Bioversity and UoB, as well as the other two participating countries, and to ARC and SANBI. All national stakeholders need to be acknowledged. In particular he wished to mention Willem, Nkat and Livhuwani as pillars crucial to put this project through. The work done was mainly for one goal, a food secure population. He concluded that DAFF commits to the implementation together with their major partners, ARC and SANBI.

Field day

On Friday 25 November the project partners visited the private reserve of De Onderstepoort, managed by ARC and the herbarium at SANBI. The nature reserve is the second top priority site for the conservation of SADC regional CWR priorities. The visit allowed the participants to see CWR populations of wild *Asparagus, Imperata, Solanum, Sorghum* and *Vigna*. During the visit to SANBI herbarium, the participants were introduced to various aspects of the work in a herbarium. Several SANBI staff explained in detail the preparation of specimens, their cataloguing, as well as the production of digital records of specimen.

Picture 1: Observing a population of wild sugarcane (*Imperata* sp.) during the final dissemination meeting field day.



Picture 2: A herbarium specimen (*Miscanthus ecklonii* (Nees) Maab.) conserved at SANBI, collected during SADC Crop Wild Relative project field work

Annexes to workshop report

Annex 1. List of participants

Name	Organisation
Noluthando Netnou- Nkoana	DAFF- DGR
Mpolokeng Mokoena	DAFF- PGR
Thabo Tjikana	DAFF- PGR
Jermina Moeaha	DAFF- PGR
Nkat Maluleka	DAFF- PGR
Tshidi Manamela	DAFF- PGR
Percy Moila	DAFF- PGR
George Phora	DAFF- PGR
Metja Sema	DAFF- PGR
Lehlogonolo Matelele	DAFF- PGR
Julian Jaftha	DAFF- CDPPH
Mabjang Dibiloane	DAFF- FIES
Moloko Mojapelo	DAFF- PP
Mokwele Mathala	DAFF
Godwill Chuma	DAFF
Mmaserame Macucwa	DAFF
Lindiwe Mgobhozi	DAFF
Samuel Kgatl	DAFF
Rincert Moremi	DAFF
Rendani Thovhogi	FIES
Willem Botes	Univ of Stellenbosch
Ntomifikile Phaliso	SANBI
Domitilla Raimondo	SANBI
Ramagwai Sebola	SANBI
Portia Mailula	SANBI
Nkhume Ramavhunga	SANBI
Given Leballo	SANBI
Clare Ntshane	SanParks
Maneshree Jugmohan- Naidu	DST
Nthabiseng Motete	ARC
Willem van Rensburg	ARC
Dean Oelefse	ARC
Michael Bairu	ARC
Shandukani Netshifhefhe	Gauteng - DACE
Juliet Rakuambo	Gauteng
Tshikolomo Khathu	Limpopo - DARD

Maisela McDonald	Limpopo - DARD
Maedza Khathu	Limpopo
Ramugondo RR	Limpopo
Catherine Mgangira	European Union
Ehsan Dulloo	Bioversity International - Italy
Imke Thormann	Bioversity International - Italy
Hannes Gaisberger	Bioversity International - Italy
Joana Magos Brehm	Univ of Birmingham - UK
Shelagh Kell	Univ of Birmingham - UK
Thandie Lupupa	SPGRC - Zambia
Chike Mba	FAO – Italy
Navindra Boodia	University of Mauritius
Yasmina Jaufeerally-Fakim	University of Mauritius
Godfrey Mwila	Agricultural Research Institute - Zambia
Dickson Ng'uni	Agricultural research Institute - Zambia
Graybill Munkombwe	Agricultural research Institute - Zambia

Annex 2. Meeting agenda

Day 1: Wednesday 23th November 2016		
09:00 – 10:00	**Welcome and introduction - Protocol**	**Chair: Noluthando NETNOU-NKOANA**
	Welcome remarks from the hosting organization	Julian JAFTHA, Chief Director: Plant Production and Health, DAFF
	Welcome remarks SANBI	Prof RJ Sebola, Chief Director: Biosystematics and Collections, SANBI
	Welcome remarks ARC	CEO of ARC or representative
	Welcome remarks EU representative	EU representative
	Highlights of the SADC CWR Project	Ehsan DULLOO, Bioversity International
10:30 – 11:00	**TEA/COFFEE**	
	Session 2: Showcasing the results of the project	**Chair: Mpolokeng MOKOENA**
11.00 – 11.20	CWR conservation planning (Mauritius)	Navin BOODIA, University of Mauritius
11.20 – 11.40	CWR conservation planning (South Africa)	Domitilla Claudia RAIMONDO, SANBI
11.40 – 12.00	CWR conservation planning (Zambia)	Dickson NG'UNI, Zambia Agriculture Research Institute
12.00 – 12.30	Discussion Q&A	
12:30 – 13:30	**LUNCH**	
	Session 3 : Showcasing the results of the project cont.	**Chair: Domitilla RAIMONDO**
13.30 – 13.50	Predictive characterisation in South Africa	Willem J VAN RENSBURG, ARC
13.50 – 14.10	Incentive mechanism for CWR in Zambia	Graybill MUNKOMBWE, Zambia Agriculture Research Institute
14.10 – 14.30	Biodiversity genomics : applications for classification of CWR	Yasmina JAUFEERALLY FAKIM, University of Mauritius
14.30 – 15.00	Discussion Q&A	
15:00 – 15:30	**TEA/COFFEE**	
	Session 4: Showcasing the results of the project cont.	**Chair: Thabo TJIKANA**
15.30 – 16.00	Concept for an integrated CWR conservation strategy in the SADC region and selection of priority species	Shelagh KELL, University of Birmingham

16.00 – 16.30	CWR conservation planning in the SADC region	Joana MAGOS BREHM, University of Birmingham
16.30 – 17.00	Conservation planning tools	Joana MAGOS BREHM, University of Birmingham
17.00 – 17.30	Discussions Q&A	
17:30	**CLOSE OF MEETING, DAY 1**	

Day 2: Thursday 24th November 2016		
9.00 – 10.30	**Session 5: Policy session**	**Chair: Willem J VAN RENSBURG**
9.00 – 9.20	National perspective on CWR conservation (Zambia)	Godfrey MWILA, Zambia Agriculture Research Institute
9.20 – 9.40	SADC policies on conservation and use of PGR	Thandie LUPUPA on behalf of Barnabas KAPENGE, SPGRC
9.40 – 10.00	Global perspective on CWR conservation and use	Chike MBA, FAO
10.00 – 10.30	Discussion	
10:30 – 11:00	**TEA/COFFEE**	
	Session 6: Lessons learnt and scaling out strategies	**Chair: Ehsan DULLOO**
11.00 – 11.45	LESSON LEARNT - Each country coordinator presents their lessons learnt and scaling out strategy (10 mins) followed by a discussion on NSAP implementation	Ehsan DULLOO, Bioversity International
11.45 – 12.00	Regional strategy on CWR in SADC	Thandie LUPUPA, SPGRC
12.00 – 12.15	Project's scaling out strategy	Ehsan DULLOO, Bioversity International
12.15 – 12.30	Discussion	
12:30 – 13:30	**LUNCH**	
13.30 – 15.00	**Session 7: Steering Committee meeting (separate agenda will be prepared) ONLY Steering Committee members**	**Chair: Chike MBA**
15:00 – 15:30	**TEA/COFFEE**	
	Session 8: Closing session	**Chair: Mpolokeng MOKOENA**
15.30 – 16.00	Report back from steering committee chair	Chike MBA, FAO
16.00 –16.30	Final discussions	Ehsan DULLOO, Bioversity International
16.30	Concluding remarks	Mpolokeng MOKOENA, DAFF
17:00	**CLOSE OF MEETING, DAY 2**	

DAY 3: Friday 25th November 2016		
9.00 – 17.00	Field trip open to project partners and steering committee members. Visit to private reserve of De Onderstepoort	**Organised by DAFF, ARC & SANBI**

Annex 3. List of acronyms

ACP	African, Caribbean and Pacific
AMO	Area management option
ARC	Agricultural Research Council
CBD	Convention on Biological Diversity
CWR	Crop wild relative(s)
DAFF	Department of Agriculture, Forestry and Fisheries (South Africa)
ECPGR	European Cooperative Programme for Plant Genetic Resources
FAO	Food and Agriculture Organization of the United Nations
NBSAP	National Biodiversity Strategy and Action Plan
NSAP	National Strategic Action Plan
PA	Protected area
PGR	Plant genetic resources
PGR	Plant genetic resources for food and agriculture
SADC	Southern African Development Community
SANBI	South African National Biodiversity Institute
SC	Steering Committee
SPGRC	SADC Plant Genetic Resources Centre
UoB	University of Birmingham, UK
UoM	University of Mauritius
ZARI	Zambia Agriculture Research Institute